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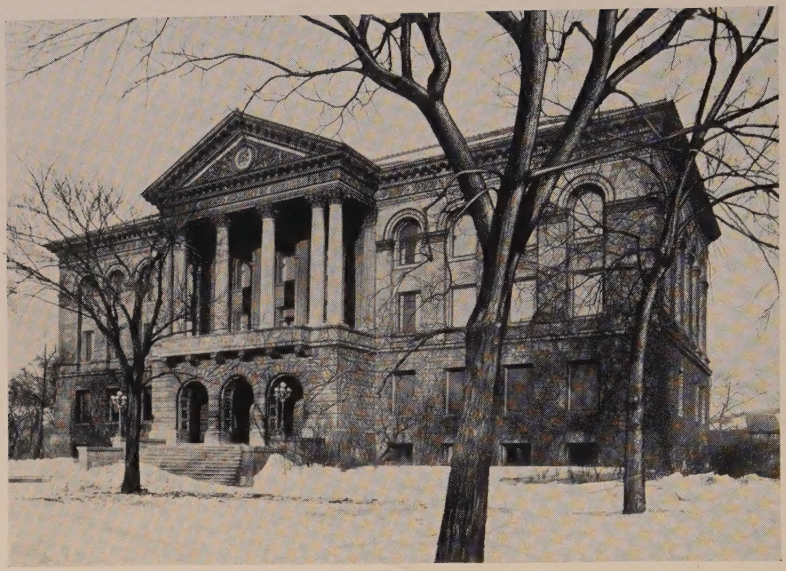

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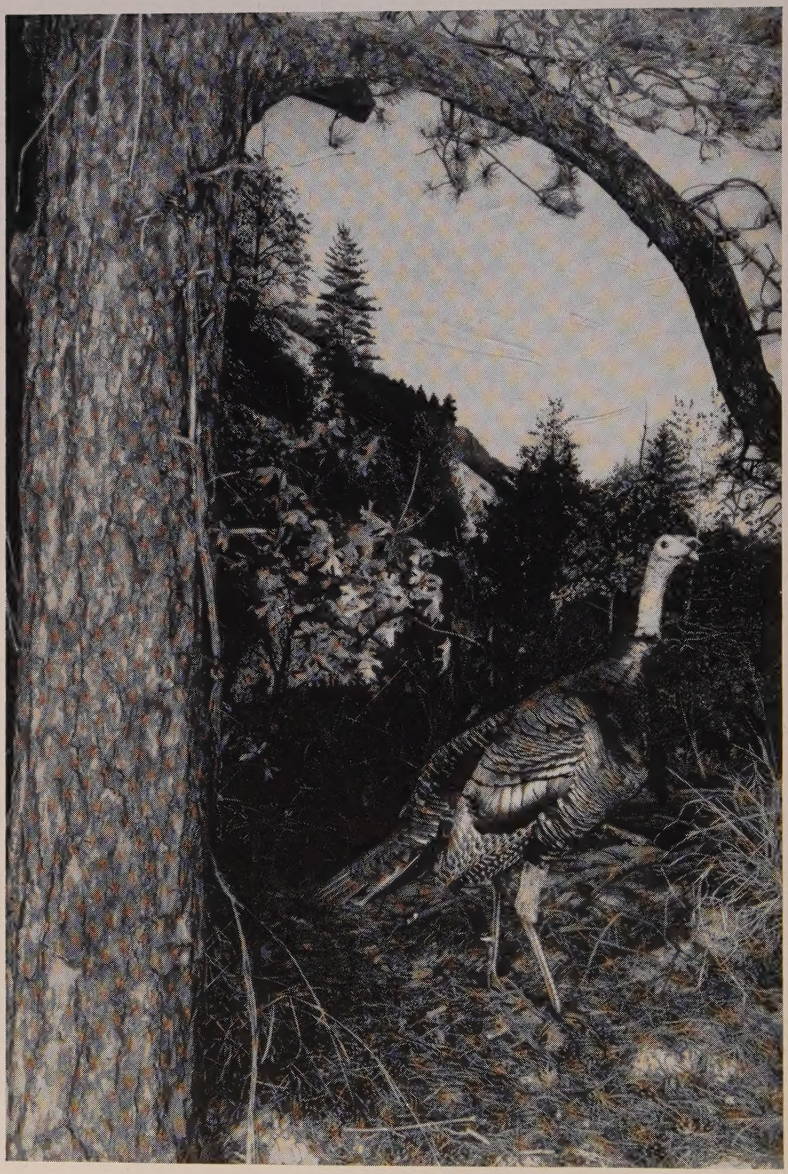


Wild Turkey: a portion of the new group in the Chicago Environs series.

It's Done With Mirrors

Gordon L. Walls

YOU bend over the museum case and contemplate the mouldy disc of bronze labeled: "Mirror, circa 1600 B. C." Your glance shifts to the cracked alabaster kohl-pot and the fragment of a wooden applicator, and back to the bronze plate, its edges serrated with corrosion and its surface pitted, lifeless, long since.

Perhaps you will ponder for a moment the antiquity of vanity. Even if you are not so philosophical, you will at least dwell upon the antiquity of mirrors. Perhaps you will wonder what clever swain it was who first delighted his lady by bringing her a polished piece of metal, sparing her thereafter those frequent hurried trips to the glassy pool among the lotuses behind grandfather's tomb.

But the inventor of the mirror was no hawk-nosed youth dreaming in the shadow of a half-built pyramid. Indeed, no man at all, but an armored shark gliding over the bottom ooze of the warm Devonian seas.

Like practically all of "man's major inventions," the mirror was long ago evolved by animals. The greater part of an animal's surface is ordinarily light-absorbent, for the average animal needs to be inconspicuous and can hardly be that if his surface is shiny. Snakes have developed "keels" on their scales to combat the shininess that comes inevitably with hardness. The mollusc dulls the lustre of his shell with a drab covering of horn.

The fishes, however, have learned that a silvery surface is protective in their particular environment. An animal under water can see upward through the surface only within a limited angle—an inverted cone, rather—the base of which forms a circular window within which objects in the air above are visible. Outside of this window, the surface is bright and impenetrable to vision from below. Against such a background, the silvery belly of a surface fish disappears from the notice of a bottom-lurking predator.

The fish's scales owe their metallic brilliancy to a deposit of guanin, a substance related to the plebeian uric acid. As the baby fish develops, he is at first transparent and hence practically invisible. With the differentiation of his tissues, however, optical homogeneity is lost and the young fish becomes opaque. He is saved from conspicuousness by the timely appearance of his coat of silver.

But even before his glassy infancy ended, the little fish was forced to take a big chance of being noticed by the wrong set of acquaintances. His eyes *had* to develop early, for such complex organs must get a head start in embryology in order to be finished on schedule with the

rest of the body. For them to function meant that they must be deeply pigmented to exclude all light except that entering the pupil to be focused properly by the lens. But when the fishlet moved, that pair of miniature shoe-buttons stood out like the proverbial sore thumb; so, he made haste to silverplate them with a coating of guanin.

This guanin covering persists over the fish's eyeball to his frying—*pardon,* dying day. Its usefulness in the fully grown fish is problematical, though where the silver covers the front face of the iris it probably aids in keeping out the light by reflecting the fraction which the pigment of the thin iris tissue would be inadequate to absorb.

Having a mirrored surface on the outside of their eyes may have given the fishes another idea, for it was among certain of them that mirrors of ingenious purpose first appeared *within* the eyeball.

You have a Boss. Having learned the cardinal rules for success in business, you are anxious to marry the boss's daughter. He naturally wishes to test your worthiness, like the royal neighbor of the king who, long ago, had three sons. But, being modern, he isn't going to ask you to bring him a chip from the tipmost top of the Glass Mountain. Oh, no, nothing easy like that. He smilingly tells you that you shall have his daughter's hand only if you bring him a photograph taken by moonlight!

You squirm in panic for a moment—then, whether you had ever heard of the Bunsen-Roscoe law or not, you remember the "time-exposure," and fear not. But no, you are sternly told, this must be a *snapshot.* You are plunged again in despair, and get little consolation from acquiring the biggest lens, the largest box, the most sensitive film on the market. The assemblage *won't* take a snapshot in moonlight. Photographers go over your equipment, finally tell you that you could succeed if only you could somehow double the film's sensitivity—that would just do the trick.

And one of them, very wise (but several millions of years behind the times, as his own pet cat could tell him) slowly says: "If you put a *mirror* in back of your film, that would use the same light twice to affect the film, and you'd get your picture though it might be a little blurred." You try it, it works, and the gal is yours!

The animals that prowl by night have no name for their light-doubling invention, the mirror which they have placed behind the retinal film of their ocular cameras. The scientist calls it the *tapetum lucidum* —the "bright carpet," literally.

What country child abroad of a starlit evening has not been sent scampering home in terror by his first experience with a pair of glowing points in the roadside bushes? His father tells him that that's "eyeshine"—and inwardly blesses the phenomenon if he likes 'possum meat, for "shining his eyes" with a bull's-eye lantern is the easy way

to locate the treed 'possum, 'coon, bobcat, or what have you, for an accurate nocturnal shot. The usual cause of eyeshine is the tapetum lucidum, and very few animals have eyeshine without a definite tapetum as its basis.

The distribution of the tapetum among the animals is rather spotty. We see it first in the sharks and sturgeons, then, in two versions, in some of the bony fishes. No amphibians have a tapetum, and no reptiles excepting the crocodiles and their near allies. No bird possesses one, but among the mammals there is hardly a group which is lacking in species provided with the intra-ocular mirror. In the mammals, at least three types occur: a simple one in all but a few of the hoofed animals, in the whales, elephants, a few marsupials and a couple of other scattered species; a more complicated one in all the flesh-eaters, the seals, and the lower monkeys; and a very peculiar type in the fruit bats and the opossum.

From this haphazard distribution it can be seen that there are large numbers of animals which ought to benefit from a tapetum, yet do not have it. Only one rodent, for instance, has a tapetum though most rodents are strongly nocturnal. This, together with the variety of types of tapetum, convinces us that the discovery of its value has been made many times, independently, by all sorts of creatures. Each has worked out the problem of seeing in "impossible" dimness in its own way.

The simplest solution was first found, not by the fishes, but by marsupial mammals, and was hit upon later by the hoofed creatures, pachyderms, and whales. The outermost layer of the retina—furthest from the light—is a pigment epithelium or pavement of thin cells. Beyond this, clinging to the outer surface of the retina, is the chorioid coat of the eyeball wall. The chorioid is also pigmented, and is loaded with blood vessels which nourish the retina. All of this pigment, like the dead black paint inside a camera, absorbs the light which has entered the eye and passed through the "film," thus preventing haphazard reflections which would produce confusing multiple images.

The tapetum of a horse or an elephant resides in this chorioid coat, in those of its layers which are nearest the sensitive retina. Here the chorioid pigment is lacking and the pigment has also conveniently disappeared from the pigment epithelium between the chorioid coat and the main body of the retina. Now, light which has passed through the transparent retina and has affected the seeing-cells on its hinder surface, the rods and cones, is no longer absorbed immediately but strikes the mirror and is thrown back through the rod cells. The two passages of light add together and the nerve fibers of the retina are stirred into action in light of about half the brightness that would be needed for vision to be possible if the tapetum were not there. The mirror of these animals is formed by layer upon layer of fibrous cells.

When it is peeled out of the eyeball, it glistens like a piece of tendon, the substance of which it much resembles.

A tapetum may occupy only a small area of the back of the eyeball, the remainder of the chorioid coat being unmodified and absorbing light instead of reflecting it. Figure 1 shows the commonest arrangement, a fair-sized triangular area; but in some cases the mirror is so broad that it backs up the greater portion of the retina's extent.

Fig. 1. Interior view of back half of eyeball of a dog. The hatched area shows the form and size of the *tapetum lucidum*. The stippled circle represents the head of the optic nerve. The right eye is shown. (After Preusse, modified.)

The thickness of the tapetum seems to determine the *color* of the light it throws back through the pupil toward the observer. If you could stand the proper series of different animals side by side (oh, yes, they'd squabble, of course!) you could see just about the whole spectrum reflected from within their eyes. Red, orange, yellow, green, blue-green, blue—all lights except violet and white itself occur as eyeshines. So far as we know, the particular color is an optical accident and means nothing in the animal's life except, perhaps, in the case of the sharks.

In Figure 2 we see the arrangement of the flesh-eaters' kind of tapetum as seen with the microscope—the same kind that also occurs in the seals and in the goggle-eyed nocturnal monkeys. Here the tapetum is also in the chorioid coat, and is again many-layered; but each layer consists of thin hexagonal tiles set edge to edge, each tile a cell packed with regular rows of needle-like crystals (see Figure 3). No one knows what these crystals are made of, but they give to the whole tapetum a powerful capacity for reflection. This is the kind of tapetum the cat owns—so perfect that one often catches its green fire even in a brightly lighted room.

So perfect, did I say? Perfect as a reflector, better than the imitations with which men now letter the signs that mark our highways. But with one great drawback—it doesn't go out of business in *bright* light but stays right there, simply doubling the problem of dazzlement with which all super-sensitive, nocturnal eyes must cope. If only a

shade could be drawn over the mirror in the daytime!

Well, just that *has* been arranged for, in some cases. Surprisingly enough, not by any of the highest animals, but by some of the fishes. In fact there are two very distinct kinds of cover-upable tapeta (the German word is *abblendbar* but there just isn't any English equivalent).

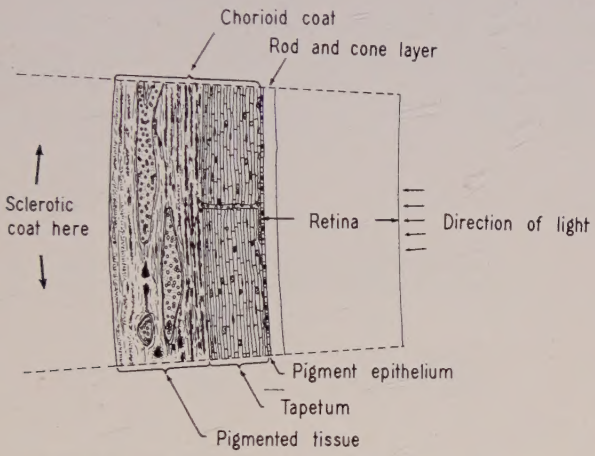


Fig. 2. Section of the chorioid coat of a carnivore's eye, showing the location and structure of the tapetum.

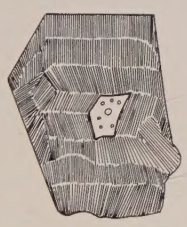


Fig. 3. Single cell from the tapetum of a cat, seen flatwise and showing the rows of intracellular reflective crystals. (After Murr, modified.)

One of these is seen in its exposed and covered phases in the two drawings of Figure 4. It is found only in a very few of the bony fishes, and not in any of our native species that we know of. In nearly all fishes, the pigment granules in the cells of the pigment epithelium of the retina migrate down among the rod seeing-cells in bright light and back away from them in dim light. In this way the rods, which are far more sensitive than the cone visual cells, are shielded in bright light and uncovered in dim light when the cones cannot function at all. In the handful of species I have mentioned, the pigment migration is also

used coincidentally to cover and uncover the tapetum in the appropriate circumstances.

Here the tapetum, instead of being back in the chorioid coat, is in the pigment epithelial layer of the retina itself. Each cell in the pavement, against which the tips of the rods point, contains a cloud of guanin crystals. These do not migrate as far toward or away from the rods as do the pigment granules, which filter back and forth among the guanin particles as illumination conditions dictate. Thus the guanin layer is uncovered in dim light and is blanketed with brown pigment when the light becomes bright. It takes only a few minutes to put the tapetum completely in or out of commission.

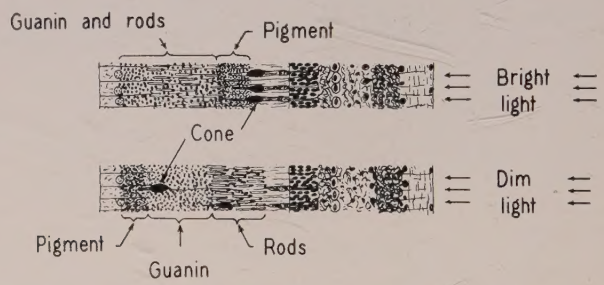


Fig. 4. Sections of the retina of the teleost fish, *Abramis brama*, showing the positions occupied in bright and dim light by the reflective guanin and the retinal pigment which shields it.

A few other animals have a tapetum formed by bright crystals deposited in the pigment epithelium cells like microscopic snow, but they have passed up their opportunity to use migrating pigment to cover their mirrors when they are not wanted. The crocodiles have scanty pigment which scarcely migrates at all, and in the big semicircular tapetum of the opossum the cells are so packed with reflective particles that the pigment has disappeared from them entirely.

Strangest of these peculiarities, the very cleverest of all tapeta is in the most primitive of animals to have a tapetum at all, the shark. These fishes have no pigment in their pigment epithelium, and their tapeta are in their chorioid coats; but even so they can be covered up. Figure 5 shows how it is done. Some of the chorioid pigment, which in other animals never moves, is migratory and contained in plate-like cells set shingle fashion. Alternating with these are other thin cells filled with the ubiquitous guanin. Were the cells set perpendicular to the back surface of the retina, the pigment could never conceal the guanin no matter where it stood in its own cells. But migrating slantwise as it does, its forward movement blocks the light from reaching

an appreciable amount of the guanin, while its backward withdrawal leaves a guanin layer which appears unbroken from the direction of the light that is being seen.

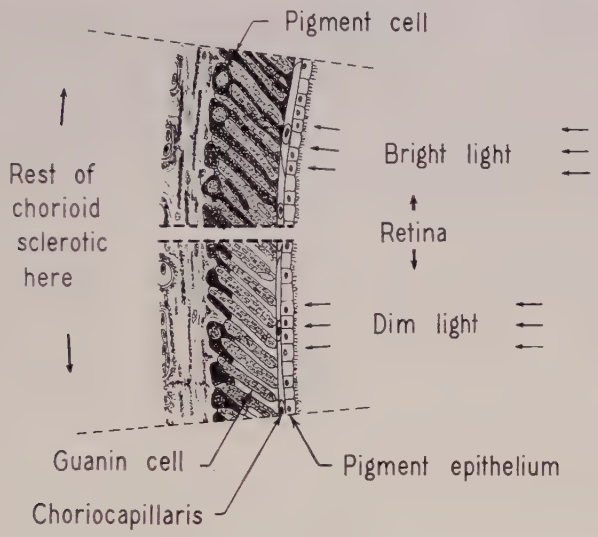


Fig. 5. Sections of the *tapetum lucidum* of a small shark, showing how the mirror cells are covered and uncovered by migratory chorioidal pigment.

Superior pussy, if she could see and comprehend this forgotten invention of the lowly shark, would be bound to say: "Now why didn't *my* ancestors think of that!" And how would our eager young Egyptian feel about it?

—*Ophthalmic Research Laboratory,*
Wayne University College of Medicine.

Sunday Afternoon Lectures

The Sunday afternoon series of lectures for 1938 will close with Margaret Morse Nice's *Home Life of Wild Birds* on December 18. After the holiday season, Sunday lectures will be resumed on January 8 with *The Black Widow Spider and her Venomous Kinfolk*, by Donald C. Lowrie, and on January 15 *The Wild Flowers of the Great Smoky Mountains*, by Dr. Stanley A. Cain of the University of Tennessee. Programs of the entire lecture series for January, February, and March will be mailed to members of the Academy and affiliated societies in the near future.

Lion in the Carmens

Tappan Gregory

(Continued from Number 3, p. 81)

IV

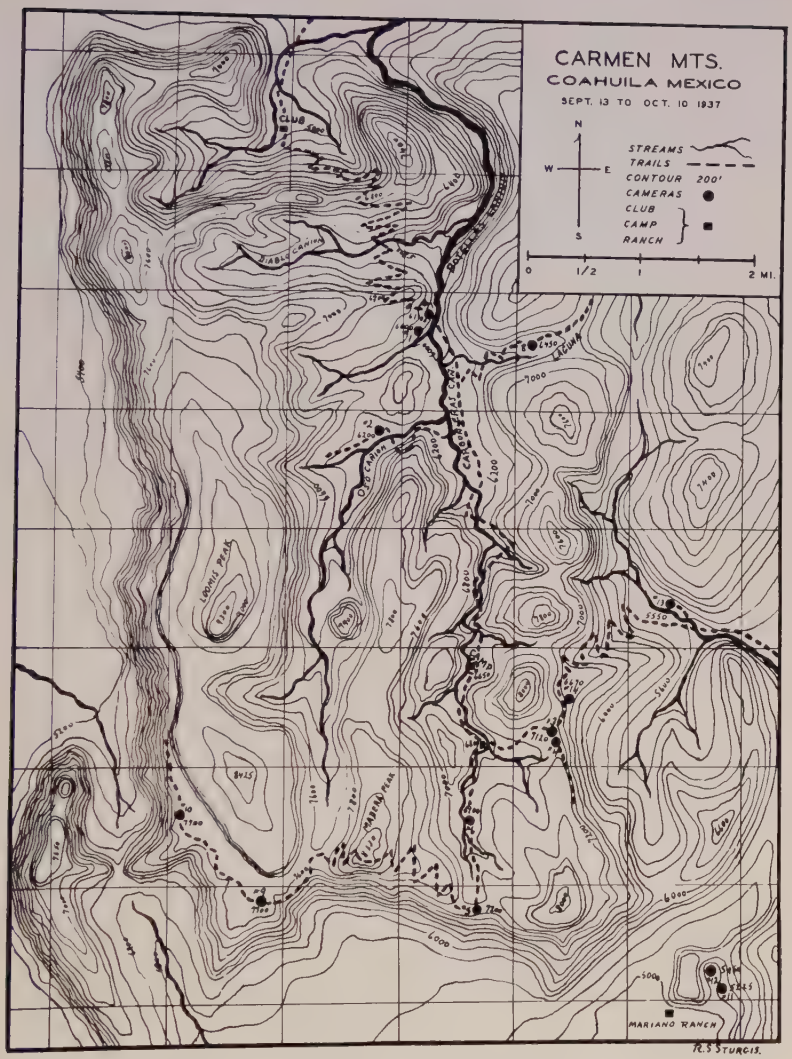
Day by day the weather grew worse and worse, culminating at length on the 25th with steady, hard rain, lasting well into the evening. To add to our discontent during this trying period, the cameras were mostly unproductive, and those that had been visited by creatures of the wild turned up nothing but rabbits. Of course, we invited this advisedly at the Laguna set, hoping that we might accumulate something of a variety, representative of the different forms traveling the trail. One deer did leave us a dim image, well fogged by moisture on the lens. But when our set beyond Madera, on which we had counted so much, followed the example of its distant neighbor and itself produced only misty rabbits, the disappointment was keen.

We continued to divide our forces in order to cover at frequent intervals the rough miles separating the extremities of our "trap line" and because of the rain, thought it wise to make replenishment of the catnip lure at each set every day or two.

It was hard to believe that no lions were revisiting any of those numerous fresh scratches which had so heartened us at the outset. We must have come into the mountains at the very inception of a great exodus to lower elevations. It seemed that every lion upon our advent had found that his schedule called for another tour of his extensive rounds. Mindful as we were that it is nothing out of the ordinary for a lion to cover twenty miles or more of tough country in a day, and knowing full well that should one be lucky to make a kill it might very well remain a week in the neighborhood of its victim, nevertheless we could not prevent disappointment and discouragement from creeping up on us and showing their ugly heads.

And still it rained. Every day we saddled the horses and dropped down fifteen hundred feet here and climbed a thousand feet or so there, and tried to be patient and conscientious and keep the cameras in order and the batteries alive and the powder dry, and the scent fresh.

Finally, on the 26th, sunshine replaced clouds, portending greater comfort and less trouble at the sets, if not better luck. On that day the No. 4 set on the nearby saddle furnished another example of how unexpected troubles may develop. It had become plain before this that when the battery case was hung from its cable on the back of the tree carrying the camera, rain was likely to seep in and exhaust the dry cells. Having this in mind at the set in question, we had laid the battery case on the tree bracket next to the camera. Inspection on the



26th disclosed the flash fired. We had hardly moved away after recharging before it blew again. The answer suggested itself, but in order to be perfectly sure on the next reload, I purposely made contact between the end of the battery case and the camera (all of our cameras are made of brass), causing an immediate discharge of the flash over my head. The wires from the fuse had been connected in such a way that when the battery case touched the camera, a short-circuit immediately developed through the cable release. There is always some-

Escarpment on top of Loomis Peak.

thing new to learn about what to do and what not to do.

Taking advantage of the bright, clear sky and consequent favorable aspect for a long, hard ride, Wood and Mariano were in the saddle early, headed for Mariano's hacienda on the floor of the desert in the Arroyo de los Alamos.

From the saddle at the foot of Madera Mountain, the great Mesa de Fresnos had appeared sharply outlined where it topped a ridge rising from the floor of the desert some eight or ten miles away. At the east end of this striking escarpment, another smaller but similar formation reared its rough outline. It was known as the Mesa de las Cruces and down its lower slope there broke away a very steep little cañon, known as the Cañon de las Cuevas, with walls abounding in jagged rocks and troublesome cactus. Mariano had reported that whenever his herd of goats came into this cañon one or more was invariably taken by lion. It seemed worth investigating.

We could not escape the feeling of the need for haste because we knew our time in the mountains was limited and we were becoming apprehensive lest the lions might not return to the neighborhood of our sets before we must leave. For up to that moment not one fresh track or scratch had been discovered since our first day in camp.

Then came the exciting news that on the previous night a lion had killed a goat in the cañon de las Cuevas and had dragged it up the rocky sides of the cañon two or three hundred yards and there buried it. It seemed a certainty that he must shortly return to his kill. Ac-

cordingly, plans were laid and preparations made for a start at daylight the next day, the 27th.

It was agreed that Young and I should pick up No. 5 and No. 6 sets, carry them down over the divide with us, place them as well as might be by the kill and then stay at Mariano's home for four or five nights, waiting for the expected return of the killer. Wood and Mariano were to accompany us, Wood to return that night and Pancho to follow with a burro, bringing bedding and supplies. Sturgis undertook to move on succeeding days our No. 9 and No. 10 sets if they did not show results and use them to replace the two taken into the desert.

V

The trail took us down a steep winding descent through cañons and scattered peaks, past an old fort and the rusty stamp mill of an abandoned silver mine, and finally to the floor of the desert at the head of the Arroyo de los Alamos. The contrast between this dry country and the fertile wooded mountains was striking. Here, at an altitude of about forty-nine hundred feet, we found typical desert, interrupted by low mesas. It was a land of mesquite, greasewood, creosote, sage and cactus—prickly pear, spanish dagger, ocotilla, barrel, fishhook, yucca and bear grass—dominated by a broken ridge of mesas to the south. These were known as Las Cruces, Fresnos and Marranos, from east to west. The arid arroyo of Los Alamos is about five miles long, and contains the homes of some seven Mexican families. Their principal occupation is raising goats and occasionally a few cattle.

Mesa de las Cruces and Mariano's Hacienda.

Not far from the head of the arroyo, we found Mariano's hacienda. It lies close to the road to Boquillas, forty-three miles away. The small patio, surrounded by a corral of yucca stems was kept scrupulously brushed, and the hard ground was as smooth and neat as a well kept wooden floor. In the compound, Mariano had constructed his two-room *casa* of rocks and adobe, with a roof of yucca leaves, as proof against rain as anyone could ask. Close by stood a one-room *casa* of similar construction, built by Pancho. Both had smooth dirt floors, and small square openings in the walls for windows.

In Pancho's dwelling, we were furnished two bedsteads, supplied with springs, and here Young and I spent five nights, thoroughly pampered by Mariano and his wife, and two attractive youngsters. The small garden, full of varied, bright colored blossoms, with blue morning-glories predominant, added a very cheerful note. Every ounce of water for drinking, cooking, washing, and watering the flowers had to be carried four or five hundred yards in buckets. With our bedding rolls on spring foundations, we were most comfortable and the fact that occasional chickens indicated a disposition to nest in our blankets did not detract the least bit from the pleasant hospitality of our host and hostess. They even insisted upon supplementing our supply of canned foods with frijoles, tortillas, jerky, and goat's milk.

The sun burned bright and hot in a clear sky every day, but after dark the mercury dropped, heavy coats were indicated and we were glad to climb into our sleeping bags.

The first formality after our arrival was lunch, but we did not tarry long, as we were impatient to reach the lion kill before the killer's return. A mile or so from Mariano's, we turned the horses into the mouth of the Cañon de las Cuevas, and pushed them as far as it was fair to ask them to go, climbing the balance of the distance to the kill up the steep sides of the cañon on hands and feet.

Here, disappointment awaited us. The night before, even while we were being told that the kill had been found, the lion returned, dug up his treasure and consumed it, with the exception of the paunch and a few bones. The prospect was discouraging. Still, if the lion were hungry, he might come back once more and we must be ready for him. One camera was trained on the remains and a trip wire stretched where it might do the most good, used in place of the tread because the rocky ground left us no alternative. Farther up the cañon, at the point where the goat had been killed, another camera was placed. These two sets became Nos. 11 and 12.

In the cool of the evening, we sat in the patio, piecing out our conversation with Mariano by combining English, Spanish and French. Most of the piecing out was done by me. Young, from years of experience on the border, managed very well with Spanish alone. And all

The saddle where the first lion was photographed.

the while we watched the direction of the head of our cañon, where we knew it must lie behind the hill that sheltered us, hoping to see the bright, white glare of burning magnesium.

In good season the next morning, we were under way for a tour of inspection, but found no change at the sets. That afternoon, a three-mile ride took us to some very interesting Indian caves of ancient origin. A series of holes of uniform diameter of about eight inches, with rough, straight sides, varying in depth from small beginnings to a maximum of about eighteen inches, cut into the rock, scattered about with no apparent pattern, puzzled us. Metate stones were numerous and here and there under the shelter of the overhanging rock, we found what appeared to be primitive maps, consisting largely of straight lines scratched deeply on rocky floors.

After supper we repeated our vigil and the next day after another profitless visit to our sets, made some photographs of Mariano, his wife, his sister, his little boy Lucilo and his little girl Jovite. This was by special appointment and proved to be a very formal occasion.

It was not until the first of October that we were cheered by finding that one of our flashes had spoken. No. 11 had been visited. We found fresh lion tracks coming in towards the set on a nearby trail. It was not altogether reassuring to note that the trip wire was not broken. But sometimes larger mammals show a remarkably delicate touch, so we were filled with hope. Over and over again, as we sat talking in the starlight, we canvassed the possibilities, each trying to persuade the

other that surely we had a lion picture at last. But determination of this must await our return to camp.

Meanwhile, word had come in that afternoon with Pancho and Wood that Sturgis had recovered an excellent picture of a bobcat from No. 7 set, taken on the night of the 28th of September, another rabbit at No. 8, and a shot of two deer at No. 1, spoiled again by mist on the lens. The latter was the only return from the first set, although the camera was not picked up until the 8th of October.

Now we were impatient to be on our way back to camp. One more night was spent with Mariano, one more early morning inspection of the sets disclosing no further activity, and then we saddled up and pushed off. The negative from which so much was expected, was carefully wrapped and carried on Young's saddle-bow in a small leather packet. Wood had told us of a fresh lion scratch found by the trail at the bottom of Juarez Cañon, and it was therefore arranged that he should retrace his steps by the direct, steep route over which we had come, picking up and bringing with him the new No. 5 set, while we rode the longer way to meet him near the spot where the next set was to be installed.

It was another beautiful day, and it was pleasant to follow up to the head of the arroyo and on through a picturesque country of easy grades, leading us finally into Juarez Cañon.

Lion at last!

The climax—another lion comes to catnip.

We were not, however, without mild adventure on the way. Before we had covered many miles, Young's horse showed signs of distress and finally collapsed under him. Our concern was not so much for the horse or for Young's bones, as it was to make certain that the treasured negative be rescued before the poor animal rolled. Fortunately, there were no casualties. Apparently the horse had been cinched too tight and once this was corrected, he seemed entirely himself again after a brief rest.

At the appointed rendezvous we unsaddled and hobbled the horses, for we knew at least an hour or so would be required for reconnaissance and the work of setting up the camera. It was pleasant to rest on the bank of the stream, which calmly rippled and gurgled its way among great smooth rocks. We had not before found in the Carmens such crystal clear water of such a steady flow. Our exercise and the soothing voice of the stream and the bright sunlight striking down between the high cliffs towering above us on both sides of the cañon, combined to make us drowsy and unambitious, and all too soon we heard the clatter of the hooves of Wood's horse calling us again to action. Careful examination of the trail in both directions from the newly discovered scratch failed to disclose other fresh sign. The site for No. 13 set thus in effect selected itself. The only available tree for the camera was a little too close, and so slight that we felt it

advisable to place the flashlamp on a separate pole.

We made what haste we could with a view to orderly workmanship, so that we might hurry to explore the possibilities suggested by Wood's report that No. 3 on the saddle above us had been fired and that he felt sure a lion had done it. The altitude of about fifty-five hundred feet at the bottom of Juarez Cañon left us a steep climb of sixteen hundred odd feet to reach No. 3. Here, while I was reloading the camera, Young measured the distance between the evident lion tracks, indicating the animal's first jump at the flash, and reported that it was thirteen feet.

Down to camp we hurried and plunged hands and face into darkroom to see what the developer might turn up. The treasure from the desert, of course, had the right of way, and when we turned on the light and discovered, faithfully etched on the emulsion, the image of the tail of a Ring-tailed Cat in the act of visiting the remains of the lion kill, our spirits sank to a very low level. They were soon largely resuscitated when the No. 3 shot proved to be at last a lion *(Felis concolor stanleylana*, named after Young)—back view it is true, but still a lion, the first lion, taken on the night of October 1st, the 16th night of duty for the camera on this set.

During the first three days of October, another rabbit picture and a shot of a Mexican cowboy dragging a long pole behind his horse, both of which were brought in from our Laguna trail set, finally exhausted our patience and the camera was picked up and shifted on the 4th of October to a spot four hundred feet or so below No. 3, on the trail to Juarez Cañon. This set, nominated No. 14, was the last one made and was never tripped.

VI

In the succeeding week we enjoyed day after day of fine, clear weather. At night the temperature would slide into the thirties, and at mid-day the bright sun would drive it up again into the high seventies. Every day we saddled up and rode the rounds. The Cuevas sets were inspected on the 4th and found fired, and then allowed to rest until the 7th, when they were picked up and brought into camp. The two resulting pictures were most disappointing. At the kill the Ring-tailed Cat had again left an impression of only its vividly marked tail, and at No. 12 set, where the lion had dragged his kill, to add insult to injury, a goat, above all things, had trod upon the tread!

Black bears were reported in the home cañon, and deer were frequently seen. But for several days little resulted from all our efforts with the cameras. The Mexican cowboy, with uncanny and unerring precision on his trip across country with his pole, had not only fired the flash at the Laguna set, but had succeeded in finding the tread of No. 2 up Oso Cañon.

We were still far from satisfied with the only lion shot and day by day grew more nervous and restless, as the time for departure marched upon us on winged feet. Each evening, tired from a day in the field, we sat until late about the camp fire, listening to the whippoorwills and an occasional great horned owl, admiring the brilliance of the stars overhead, always hopeful of what the next day might bring—conjecturing, debating, wondering.

Then, finally, No. 13 boomed into action. On Tuesday, the 5th, Sturgis and I found, on the first inspection after the making of the set, that it had been visited. The ground was greatly disturbed, the cable unburied and damaged and for an hour we considered the situation, debating the advisability of bringing in the set, in view of the fact that so few nights remained. Finally we concluded to leave it re-established in as good order as possible, picked up the negative and climbed back up the long ascent. In the darkroom there was much excitement but some chagrin when the image of a great tom lion appeared, traveling too rapidly for the shutter speed, swinging his head, lashing his tail. We could not be sure whether he was rushing through or trying to skid to a stop for a whiff of catnip. Anyway, we admired the great muscles and enormous paws which were clearly delineated on the negative.

It was not easy to be philosophical. There remained but three nights at most before all the cameras must be in camp, ready to pack upon the burro train for the return to civilization. It hardly seemed possible that a lion would again travel the Juarez trail before we left, but we had learned from bitter experience to play out our string to the very end.

Wednesday morning Hazlett and Landon left us—the first break in our ranks—the forerunner to the general exodus soon to mark the close of our Carmen Mountain chapter, a sobering incident to those of us who remained. And our spirits were in nowise buoyed by reports that the night had been barren of results and no flash had been fired. Meanwhile the darkroom had been carefully packed and put away, and time was being devoted, wherever it could be usefully, to preliminary gestures in preparation for our move.

Thursday we saw clouds again in the sky for the first time in nearly two weeks and thunder reverberated through the mountains most of the afternoon. It was warmer in the evening too, but that was a good day. Investigation disclosed that on the night of the 6th of October, another lion, from all appearances a female, had taken her own picture at No. 13 set. Wood and Mariano had been clear down to the desert to pick up the Cuevas cameras and came back through Juarez Cañon, recovering the negative there and dismantling and bringing in that set too. The darkroom was hastily unlimbered and at last vouchsafed

us a glimpse of that for which we had come so far and labored so diligently. Then it was carefully packed once again, for Friday was to be the last full day in camp, devoted to recovery and boxing of apparatus. But there was one pleasant surprise left. The Oso Cañon camera, not inspected since the 6th, yielded a very pleasing shot of three deer —doe and fawn and odd doe. Again we dug out the darkroom and occupied ourselves until well into the evening developing and printing.

It was a beautiful, still, clear night, tempting us to sit late by the camp fire reviewing the events of the trip, minimizing its disappointments and reviving recollections of pleasant and satisfying incidents, storing them up for renewed enjoyment over and over again in the years to come.

On Saturday, the 9th, camp was broken and advantage taken of the fine weather to savor to the full the pleasures of a ride through those delightful mountains and down to the club house. I am sure we all wished that the four hours occupied in that return journey could have been doubled and redoubled in duration.

Then depression at the idea of leaving stole into our thoughts. The skies joined our mood and by mid-afternoon, wept upon us disconsolately, repeating this manifestation off and on during the night, leaving the valley as it appeared to us the next day, filled with fog under heavy, low-hanging clouds. Into such a prospect we drove soon after noon on the 10th, saying goodbye reluctantly to our loyal packers, our sturdy and hard working horses and the surprising little burros. The skies had begun to clear before we reached Villa Acuna, but some delays were inevitable, and it was close to two o'clock on the morning of the 11th before we rolled into San Antonio at the end of our long trail.

The Snakes of Goose Pond Hill

H. K. Gloyd

A high ridge covered with hardwood timber and dense undergrowth, with a cypress swamp at the foot of its western slope, Goose Pond Hill in southeastern Missouri owes its somewhat questionable renown to the presence of considerable numbers of cane brake rattlesnakes, copperheads and cottonmouth moccasins which, together with several kinds of non-venomous species, find winter shelter among the depths of its ledges. Philip D. Evans, a competent amateur herpetologist, until recently of St. Louis, was led to visit it a few years ago by an account in a small-town newspaper of the killing of great numbers of snakes on the hill each spring and fall. The general region is of interest because it is one of the northern limits of a number of species typically southern in distribution. During the warm months these reptiles spread into the lowlands, the water snakes into the nearby swamp. Successful collecting on the hill must be nicely timed to coincide with the snakes' exodus from the ledges in the spring or their return to hibernating quarters in the fall.

Each year, for almost the last ten, Evans and I had planned, on paper, a snake-hunting excursion among the rocky bluffs of southern Illinois and southeastern Missouri only to have to abandon it at the last moment. This year, however, two short trips were made with the object of collecting specimens and making motion pictures in this interesting area. The first was in early June, too late to find snakes

near the hibernating dens, but the second was at a more fortunate time during the first week of October. A somewhat unusual continuance of warm weather had delayed the snakes' return to the rocks, but a few had already taken up positions in the crevices and others were found apparently on the way up.

One very large rattlesnake, larger than any either of us had ever caught before, was discovered beneath the end of a once-great log. It was captured not exactly with ease but, being in the open, presented no special difficulties. It bears a scar which Evans suspects may have been caused by his brass hook when two years ago he attempted, unsuccessfully, to remove a snake of similar size from the "upper den." Exploring the crevices with the aid of flashlights, we found several others, all out of reach of our hooks or in a position to wedge themselves too tightly for capture without mutilation.

No copperheads were seen, but several cottonmouths were found in the open, either on the hill or in the nearly dry bed of the swamp below. One made its capture easy by voluntarily coming out of a crevice to resent molestation! Pilot black snakes and blue racers, as well as several other cottonmouths, were seen far back in deep crevices from which they could not be extracted.

The last remnants of the cypress swamps once extensive in that region are now being drained, all the useable timber seems to have been cut, and the reptiles dependent upon such a habitat are likely to disappear from the area within a short time. Even now Evans notes a decrease in the abundance of these animals much below that of only a few years ago. At the time of our last visit new farm buildings were under construction at the edge of the former swamp within pistol shot of the hill, small fields of corn stood ready for harvesting, and a path formerly difficult for foot traffic had been made passable by automobile.

Soon the "grim castanets" of Old Horridus will no longer sound on Goose Pond Hill; he who in haughty dignity ruled the rocks these many centuries, asking but "to lie, untrodden, in the sun," can not survive when man is near; he whose grandfathers, and their fathers' fathers, once held sway throughout a wide domain must accept his fate, and follow his ancestral cohorts into the forever-and-ever land.

To a Dying Pelican

Old brown pelican, hoary headed old pelican—many the year, majestic as a great frigate you rode the tides of the Indian River, or, like a giant spear, clove with tremendous plunges the tumbling surges outside the barrier reef. Shrewdly you followed the hunting porpoise and caught the small fish fleeing to the surface in panic before him. One leapt and you seized it midair. I have seen it.

Your great feet are but black pads now, the toes all amputated by shark or barracuda. Now it is hard to take off—hard to propel yourself, as once, in swift, certain pursuit of swift prey. Your time is done.

On a little beach, formed in a breach of the river wall, you haul ashore. I approach and you thrust out your great awkward beak, hissing. But not in fear, not in manifest weakness; rather as one who would say, "Be off. I am concerned in the business of dying, I do not want to be disturbed." Then you close your eyes, turn your head and, with ridiculous beak laid gently back beneath the scapulars, you await the stroke . . . When I passed an hour later it had fallen.

—Edward R. Ford.

MUSEUM ACTIVITIES

Museum Improvements

The main lobby of the Museum is now being modernized by the rearrangement of exhibits and redecorating. The large central case with groups of night herons, muskrats, fresh water fishes, and mushrooms has been removed and the marble mosaic floor is being repaired and refinished. Some of the smaller cases and the plaster casts of fossil reptiles on the walls will be moved to another part of the Museum in the near future. New cases of a different type are now under construction and when installed on the north wall will contain displays of seasonal interest which will be changed at frequent intervals. This plan, it is believed, will greatly improve the appearance and increase the usefulness of the Museum lobby.

The Evans Collection of Missouri Reptiles

A collection of about 600 reptiles from the state of Missouri has been received by the Academy as a gift from Philip D. Evans, of St. Louis. This material fills many gaps in the knowledge of the distribution of the reptiles of that region and forms a basis for the extensions of the known ranges of several species and the verification of numerous doubtful records.

Mr. Evans has for many years been an enthusiastic but critical student of the reptiles of Missouri, especially snakes, and has made this collection with careful attention to good preservation and accuracy in labeling. Many localities in which little or no previous collecting had been done were visited on numerous occasions and consequently are well represented. Mr. Evans' careful work has helped to clarify a number of obscure problems in reptile distribution and to correct some erroneous records, based on inadequate data or misidentification of specimens, and repeatedly published in herpetological literature. The diligence and discrimination employed in assembling this material makes it especially useful and the Academy is fortunate in having acquired this valuable collection.

The Children's Library

For a number of years the Academy has maintained a small natural history library for children in the room used also as the public office of the Museum. Because of insufficient space and lack of funds for new books, periodicals, and bindings, its usefulness has not been all that could be desired. In spite of this a considerable number of children visit the library and use the books in the afternoons during the week and on Saturdays.

Believing that such a library, adequately supplied with suitable books and properly managed can do much to stimulate and sustain the interest of the younger generations in the world of nature, and that such a project is a tangible and desirable feature of present-day education, the Director and the staff are making plans for increasing the effectiveness of this phase of museum activity. Conferences with representatives of the Chicago Public Library have resulted in encouragement and helpful suggestions from experienced librarians. If space can be made available for the public office elsewhere in the building additional book shelves,

tables, and chairs will be added and the entire room devoted exclusively to the library. An attendant who will assist visitors in finding material of special interest will be in charge, and a suitable system for the maintenance of records will be devised. Posters and lists of suggested reading will call attention to new books or literature on timely subjects. Suggestions from teachers of nature study and biology as to correlating source material with school work will be welcomed.

Members of the Academy and others interested in his project can help very greatly by donating suitable books or funds to be used for purchasing new books, rebinding badly worn standard works of reference, and binding periodicals. The need of funds for binding is especially acute for many excellent volumes have been used so constantly by visitors that they are now in danger of serious damage unless immediate repairs are made. A friend of the Academy has recently given a complete set of *Nature Magazine* which, when bound, will be placed on the shelves of the children's library. Other similar periodicals are already available for this purpose when protected by bindings.

Anyone wishing to assist in the realization of this project is asked to communicate with the Director.

Mr. Edward R. Ford, honorary curator of ornithology, is again living in Chicago this winter and spending considerable time at the Museum. He is cataloging new accessions to the collections in his charge and in advisory capacity is assisting Mr. Wright and the technical staff in planning new exhibits now in the initial stages of preparation. For a number of years Mr. Ford has lived in Newaygo, Michigan, during the summer months and has stopped in Chicago for a time en route to or from Florida or southern Texas where he has spent the winters. His loyal interest in the Academy over a period of many years continues to be an appreciated stimulus to the members of the staff.

New Members

The following were recently elected to membership in the Academy:

Contributing

Captain Charles G. Sauers

Sustaining

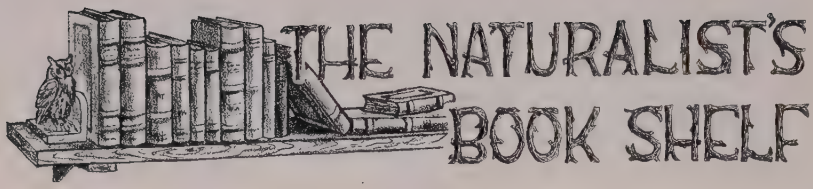
Robert Clark
Dr. George D. Fuller

Associate

Harold H. Bailey
Julia E. Blanchard
Eva S. Cowan
Madeline N. Herbert
John Keller Karlovic
Julian W. Mack, II
Oscar C. Pfaus
Paul Pueschel
Erma Roman
Dr. Robert J. Schoffman
C. C. Taylor
Ben H. Wilson

Among Academy visitors during the past few weeks were Mr. and Mrs. Fred Gibson, of the Boyce-Thompson Southwestern Arboretum, Superior, Arizona, of which Mr. Gibson is director; Dr. Dudley Jackson of San Antonio, Texas, the leading American authority on snake poisoning and its treatment; Laurence M. Klauber, curator of reptiles and amphibians, San Diego Society of Natural History; and R. Pierce Artran of Los Angeles who is preparing a book on the venomous animals of the United States.

Earl G. Wright, curator of exhibits, attended the annual meeting of the American Ornithologists Union, at Washington, D. C., October 18-21. An outstanding feature of the program was the showing of numerous reels of motion pictures in color which strikingly demonstrated the many recent technical improvements in color film. Mr. Wright spent some time with Walter A. Weber, well known bird artist now with the United States National Park Service.



The Log of Tanager Hill

By Marie Andrews Commons

Williams and Wilkins Co., 1938, 8vo, cloth, 224 pages, 12 plates, 1 map. $2.50.

Although many articles dealing with various features of bird-banding have appeared in periodical literature during the past two decades, nothing in book form has heretofore been published about an individual banding station. Mrs. Commons' book about the station which she and her husband operated for eight years is therefore a pioneer venture which we hope will increase interest in and gain new devotees for bird-banding.

"For many years we had belonged to the sentimental class of bird lovers who are prone to condemn any methods that they do not understand and it took us a long time to accept the idea of trapping a bird and placing upon him fetters that we imagined might prove an incumbrance. It seemed a faithless betrayal of the confidence we had gained with such painstaking care and so we looked askance at bird-banding. But the time came when we could no longer close our eyes to the definite results that were being accomplished by the opening of new ways to the understanding of bird behavior and the consequent affording of greater opportunities for their conservation. . . . At the American Ornithologists' Union meeting in 1922, we agreed to venture upon this new enterprise in a very small way. . . ."

And thus started the banding activity of the Commons' at beautiful Lake Minnetonka in the Minnesota Lakes Country, which resulted in the banding of over eighteen thousand birds, and much additional knowledge for the annals of ornithology.

Considering the fact that a mass of information is incorporated in this little volume, and that a diary style is followed for the eight years of activity (a difficult way to retain present-day readers), the book is full of charm and interest, not only to the bird-bander, but to anyone at all interested in birds. The introduction by F. C. Lincoln traces the history and objects of bird-banding for the uninitiated; the appendix of an analysis and tabulation of returns and recoveries adds much to the reference value of the book for the initiated. It is a fitting memorial to the memory of Frank Watkin Commons and will prove an inspirational aid to American bird-banding.

Mrs. Commons writes, "One should be a poet to picture the life of a bird-bander, a life in which every sense is stimulated, every perception sharpened and each day becomes an adventure." The book gives the adventure. Why don't you try it?—W. L. Necker.

The Social Life of Animals

By W. C. Allee

W. W. Norton and Company, New York, 1938, 293 pp., $3.00.

In the satisfaction of such basic drives as hunger, recuperation, and mating, an animal is brought into direct or indirect contact with the environment, and competition results. This competitive tendency among animals has been recognized by biologists for many years, and at one time was considered to be one of the most dominating influences at work in the survival of the most fit

species. Within more recent times a second tendency has been found to have a widespread distribution throughout the natural communities of organisms. This second tendency is that of cooperation, and it is with the nature of the cooperative influence, its distribution, evaluation and application to human societies, that Professor Allee is concerned in his most recent book, *The Social Life of Animals.*

Some twenty years ago Professor Allee began an experimental attack upon the problem of animal aggregations, their causes and effects. The data upon this problem were summed up in his book, *Animal Aggregations, a Study in General Sociology,* published in 1931. A popularized version was published in 1932, *Animal Life and Social Growth.* His latest book, *The Social Life of Animals,* ambitiously undertakes the summing up of the aggregations problem, particularly the social aspects of animal life, and the biological applications and implications in human society. The volume comprises a series of lectures given at the invitation of the Norman Wait Harris Foundation of Northwestern University.

There are eight chapters in the book. The subject is introduced from the point of view of an experimental biologist. The main thesis is that all social action, not excluding the societal organization of the human species, rests upon a biological background, and that a thorough elucidation of social action in general will serve to place human society upon a broader and more intelligent foundation. To this end, the beginnings of cooperation are sketched in the third chapter and the aggregations of more highly organized animals are discussed in the fourth, fifth, and sixth chapters of the book. Especially valuable here is the scholarly attempt to analyze population physiology and to bring this material into harmony with the modern genetic point of view with respect to population size, growth, and adaptation. Group behavior versus the behavior of isolated animals, and the effect of the group upon learning are discussed for a variety of organisms, among which cockroaches, parrakeets, and gold fish are especially well treated. This discussion affords additional evidence for the widespread existence of social and partially social behavior. The author points out that from such a partially social or social substratum highly developed societies may emerge, where the conditions are suitable, as they have arisen among ants and man.

The sixth chapter on group organization deals with the little-known but highly important organization pattern which exists in aggregations of higher animals, particularly the social order in flocks of chickens, white-throated sparrows, pigeons, ring doves, canaries, and parrakeets among birds, as well as gregarious mammals including man. It is shown that in many of these groups a definite social hierarchy exists. This is frequently referred to as the "peck-order." A despotic peck-order may be present in one species, or in another form the group may be more democratic in its organization. Obviously the study of social material has a great deal to offer us on the problem of leadership and the organization of human societies, especially since the peck-order is such an obvious phenomenon in man. This human peck-order is very interestingly brought out by Professor Allee in one of his earlier books *(Animal Life and Social Growth,* pp. 153-154).

The last two chapters integrate human society into the general biological background of social animals. In many ways the seventh chapter on human implications is one of the most searching discussions of some of our modern problems that has appeared. These last two chapters will repay careful and thoughtful consideration.

Coming as the book does after a long and successful experimental approach to a biological problem, *The Social Life of Animals* may be looked upon as an authoritative synthesis of thought upon this subject, and its general context is particularly opportune at the present period of world unrest.—Orlando Park.

Life in an Air Castle

By Frank M. Chapman

D. Appleton-Century, 1938, xii, 250 pages, 31 plates, $3.00.

Now that the United States is again in the throes of winter, and nature is on the surface apparently quiescent, while many of us sit at our firesides longing for spring and renewed acquaintance with nature, Dr. Chapman is preparing to leave on his annual pilgrimage to Barro Colorado Island—tropic paradise in the Panama Canal Zone—which he has visited almost yearly since its inception in 1923. This year you can accompany him at practically no expense! His new book, *Life in an Air Castle,* just as his earlier *My Tropical Air Castle,* doesn't tell you about Barro Colorado and its fascinating denizens, but actually takes you there and shows you the intimacies of the tropical rain forest. You do not *read* Dr. Chapman's book, you *experience* it!

Barro Colorado Island was formed by the damming of the Chagres River to form Gatun Lake, which flooded the surrounding country and left several islands of which Barro Colorado is the largest. In 1923 the governor of the Canal Zone placed the island in charge of the Institute for Research in Tropical America, under the direction of which laboratories and trails have been developed so that students may study the magnificent tropical fauna and flora under the best conditions. Except for the "laboratory clearing" the island may be considered unaffected by man, the trails and cabins at the ends of some of these trails being negligible in their effect on its bios. This has been a haven for students of many phases of biology who have produced important contributions to science, but, of the many scientists who have used the Island Laboratory, Dr. Chapman is almost alone in presenting his researches not only in technical journals for his fellow-naturalists but also in a popular style in the two delightful books on his "Air Castle."

This recent book takes us from New York on the *Ancon* through the Carribbean to Cristobal, and thence to the island. We are introduced to the "Air Castle" and its new balcony, a window into the tropical forest before which a panorama more varied and versatile than that of any stage unfolds itself. The actors form an all-star cast from the colorful blue and red tanagers, motmots, and trogons to José, the dextrous coati, and other mammals. Chapters on the making of a cayuco—native dugout canoe—the history of the island, and an appended list of the birds furnish interesting material "between the acts."

For the nature lover and travel-minded layman and the student of animal behavior, for the adolescent idolizer of "explorers" and the senescent dreamer, this is a book to take one away from the blistery cold of the northern holiday season to the warm and ever-entrancing tropics.—W. L. Necker.

Birds of the World

By the Federal Writers' Project

Albert Whitman & Co., Chicago. 1938. 205 pages. 100 photographs. Royal Octavo. $1.75.

A neat little volume, well laid out and attractive in appearance, with an abundance of pictures. Since all the orders of birds of the world are considered, only a small amount of space can be given to any one group. The form followed is a page of description for each order, then alternate pages of text and photographs of each group. No scientific names are used except as captions. The illustrations are well chosen, on the whole, although a great improvement would be effected if fewer photographs had been used which are too obviously from museum mounts. The block prints scattered through the book are excellent and novel.

Intended for a popular audience, this volume can be recommended for people with a casual interest in birds or for the purpose of stimulating the interest of children.—W. L. Necker.

THE NATURALIST'S CALENDAR OF EVENTS

This department aims to bring together a chronological list of events and activities of general interest to naturalists of the Chicago Region. Organizations not represented in this issue are invited to send us their announcements for future numbers. For more detailed information write or telephone the office or representative of the organization in question.

CHICAGO ACADEMY OF SCIENCES, Lincoln Park at Clark and Ogden Ave., Diversey 5871.

CHICAGO AQUARIUM SOCIETY, Mr. Harmon K. Greene, Secretary, Plaza 2088. Meetings at the Harvey Restaurant, Strauss Building, third Wednesday of each month.

CHICAGO CACTUS SOCIETY, Mr. Frank K. Balthis, President, Garfield Park Conservatory, Van Buren 8100. Meetings last Sunday each month, Garfield Park Conservatory, 3:00 P. M.

CHICAGO ENTOMOLOGICAL SOCIETY, Mr. Alex K. Wyatt, Secretary, 5909 N. Virginia Avenue, Ravenswood 3115.

CHICAGO ORNITHOLOGICAL SOCIETY, Mr. Rudyerd Boulton, President, Field Museum, Wabash 9410. Meetings third Tuesday each month, Crerar Library, 8:00 P. M.

FRIENDS OF OUR NATIVE LANDSCAPE, Miss R. B. Eskil, 6016 Ingleside Avenue. Hyde Park 8313.

GEOGRAPHIC SOCIETY OF CHICAGO, 7 S. Dearborn, Randolph 5293. Resumes meetings in October.

ILLINOIS AUDUBON SOCIETY, Chicago Academy of Sciences, Diversey 5871.

MEN'S GARDEN CLUB OF THE CHICAGO REGION, Mr. O. V. Morgan, 404 Washington Street, Elmhurst, Secretary. Meetings second Thursday each month.

MID-WEST HORTICULTURAL SOCIETY, Administration Building, Garfield Park, Van Buren 8100. Meetings last Friday each month.

PRAIRIE CLUB, 38 S. Dearborn Street, Dearborn 3737.

STATE MICROSCOPICAL SOCIETY OF ILLINOIS, W. L. Necker, Chicago Academy of Sciences, Diversey 5871.

Dec. 12 Illinois Audubon Society Public Lecture, *Colorado Wild Life,* Alfred M. Bailey of Denver, Academy Auditorium, 8:00 P. M.

Dec. 16 State Microscopical Society of Illinois, motion pictures of pond life, Academy Auditorium, 8:00 P. M.

Dec. 17 Prairie Club walk, Winnetka-Wilmette, 5 to 6 miles.

Dec. 18 Chicago Academy of Sciences, public lecture, *Home Life of Wild Birds,* Margaret Morse Nice, Academy Auditorium, 3:00 P. M.

Dec. 18 Chicago Cactus Society, Christmas party, Garfield Park Conservatory, 3:00 P. M.

Dec. 18 Chicago Entomological Society, Children's Library of The Chicago Academy of Sciences, 2:00 P. M.

Dec. 20 Prairie Club, open meeting, Fullerton Hall, 8:00 P. M.

Dec. 21 Chicago Aquarium Society, Harvey Restaurant, 308 South Michigan Avenue. Dinner at 6:45 P. M.; meeting at 7:45 P. M.

Dec. 22 Amateur Herpetologists, *Snake Poisons and Poisonous Snakes,* Dr. Howard K. Gloyd, Academy Auditorium, 7:30 P. M.

Dec. 29 Prairie Club walk, Wilmette, about three miles.

Dec. 30 Mid-West Horticultural Society, Administration Building, Garfield Park, 8:00 P. M.

Jan. 2 Prairie Club walk, Willow Springs-La Grange, 7 to 11 miles.

Jan. 7 Prairie Club walk, Olympia Fields, 5 to 6 miles.

Jan. 8 Chicago Academy of Sciences, public lecture, *The Black Widow Spider and Her Venomous Kinfolk,* Donald C. Lowrie, Academy Auditorium, 3:00 P. M.

Jan. 10 Geographic Society of Chicago, illustrated lecture, *West Around Cape Horn,* Captain Warwick Tompkins, Orchestra Hall. (Members only.)

Jan. 15 Chicago Academy of Sciences, Public Lecture, *The Wild Flowers of the Great Smoky Mountains,* Dr. Stanley A. Cain, Academy Auditorium, 3:00 P. M.

Jan. 15 Chicago Entomological Society, Children's Library of The Chicago Academy of Sciences, 2:00 P. M.

Jan. 17 Friends of Our Native Landscape, annual mid-winter dinner. Colored pictures of plant life in the Smokies will be shown by Dr. Stanley A. Cain and a talk will be given by Jens Jensen. Chicago Engineers' Club, 314 South Federal Street.

Jan. 18 Chicago Aquarium Society, Harvey Restaurant, 308 South Michigan Avenue. Dinner at 6:45 P. M.; meeting at 7:45 P. M.

Jan. 19 Amateur Herpetologists, discussion of amphibians and turtles of Illinois, Academy Auditorium, 7:30 P. M.

Jan. 24 Geographic Society of Chicago, illustrated lecture, *The Leopard of the Air,* Captain Charles W. R. Knight, Orchestra Hall. (Members only.)

Jan. 27 Mid-West Horticultural Society, Administration Building, Garfield Park, 8:00 P. M.

Jan. 29 Chicago Cactus Society, Garfield Park Conservatory, 3:00 P. M.

Some Academy Publications Available at Reduced Prices

A few slightly soiled copies of several numbers of the *Bulletin of the Natural History Survey* will be sold at approximately one third of the original price. The titles follow:

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